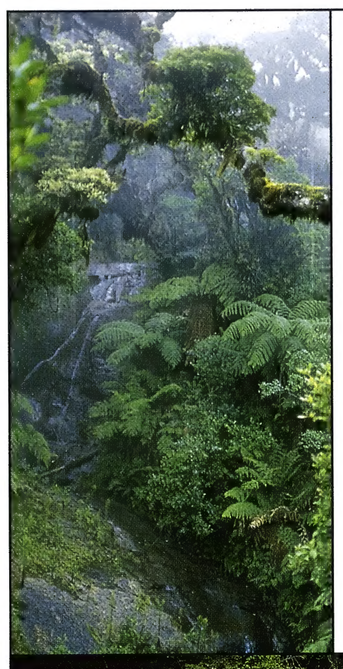
Exploration in the Tropics

Research at the Missouri Botanical Garden



◀ Bolivia: **The Tropics: Tropical evergreen forests cover 7 percent of the world's surface.** There are about 250,000 species of flowering plants in the world, **two-thirds occur only in the tropics**—about 170,000 species. **Half of all tropical plants occur in the New World tropics** south of the U.S.-Mexican border, about 30,000 in tropical Africa, approximately 8,200 in Madagascar, and 40,000 or more in tropical and subtropical Asia. **All tropical forests are likely to be destroyed or permanently changed within the next fifty years.** Explosive human population growth, widespread poverty, malnutrition, and a lack of knowledge about how to utilize tropical resources properly are causing this problem. **Tropical forests everywhere are being consumed rather than managed.** [9]

◀ Ecuador: **Deforestation:** Each year, about 25,000 square miles (65 million hectares) of tropical evergreen forest are cleared or badly damaged—an area about half the size of Illinois. As the forest goes, so go thousands of species of plants and animals living in it—many completely unknown. **The underlying causes of deforestation and forest degradation are widespread poverty, explosive population growth, and inappropriate land-use practices.** [4]

▶ Brazil: **Slash and Burn: Approximately 50 acres (22 hectares) of lowland tropical rainforest are cut every minute.** Tropical agricultural systems based on slash and burn formerly proved very successful when it was possible to allow the forest around plots to be reclaimed by the surrounding forests. Population pressures, and the relentless search for firewood, now preclude this possibility. [1]

▶ Costa Rica: **Biodiversity:** The planet Earth's elegant assemblages of plants, animals, and microorganisms are all at risk. **At least two-thirds of all plants and animals on earth live only in the tropics.** Scientists have discovered and named many of the kinds of plants that live in the tropics, but most are very poorly known. [13]

▶ Central African Republic: **Extinction—Minimum Size: Knowledge is absent.** We do not know what the smallest size area for preserving assemblages of plants, animals and microorganisms over the long term is. Species are disappearing rapidly from the small forest fragments that remain. Research in tropical conservation management demands urgent attention. Pictured: *Entandrophragma* (Meliaceae). [3]

▲ California: **Tropics vs. Temperate:** MBG is the coordinating center for the *Flora of North America* project. An account of all of the wild plants that occur north of Mexico, this publication of some 12 volumes, which involves the collaboration of some 20 institutions and hundreds of individual authors throughout the world, is building an open-ended electronic information system about the plants of the continent. [8]

◀ Cameroon: **Tropics vs. Temperate: At least twice as many species occur in the tropics as in temperate regions.** MBG concentrates its floristic and monographic works in the tropics, particularly in Central America, northern South America, and Africa, including Madagascar. [11]

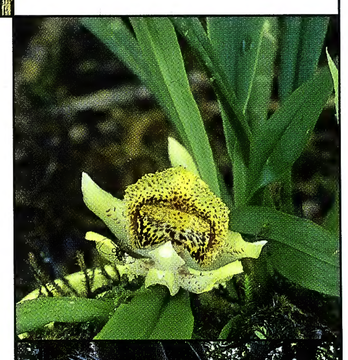
▶ Upper Amazonia, Peru: **Species Diversity: The great majority of kinds of plants, animals, and microorganisms that occur in the tropics are both unknown scientifically and in danger of extinction.** MBG scientist Alwyn Gentry has shown that the rainforests of upper Amazonian Peru may be the world's richest in tree species. He found as many as 283 tree species in a one-hectare (about 2.5 acre) patch of forest. [4]

▶ Bolivia: **Species Diversity—Altitude:** Alexander von Humboldt (1769–1859), the famous 19th century explorer, early described **the relationship between altitude and latitude.** As one climbs a mountain, the plants and animals come to resemble those found much farther north or south. In the tropics, sharp differences exist between the different zones of vegetation, so that many species often occur together in a very small area. [10]

◀ Cameroon: **Species Diversity—Coevolution:** Termite nest and *Mesobotrium dusenii* (**Euphorbiaceae). These red seeds attract birds, which feed on the fleshy white appendages, called arils, and spread the seeds about. Termites are abundant in the tropics and, along with ants, contribute greatly to the cycling of materials in tropical ecosystems. [12]

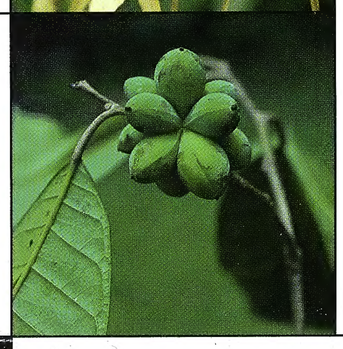
◀ Ecuador: **Species Diversity—Familial Success:** More than 95 percent of all orchid species occur in the tropics, where about one in six plant species belongs to this family. About 70 percent of all orchids species are epiphytic—growing on the branches of trees. [2]

▶ Ecuador: **Discovery—236 New Species: Scientists have discovered and named no more than one out of six of the more than three million to 30 plus million estimated species of tropical organisms.** Last year the MBG staff published descriptions of 236 species new to science. Two specialists in the orchid family described more than 80 of these. Pictured: **Benzingia* species (**Ochidaceae), a new species recently discovered by MBG scientist Calaway Dodson, found near Lita, Ecuador. [2]



◀ Ecuador: **Habit—Epiphyte: Approximately 29,000 species of tropical plants are epiphytes, representing 83 families.** Although these epiphytes have access to abundant sunlight, they dry out rapidly following rainstorms and must capture their nutrients from airborne dust. Pictured: two subspecies of *Phragmipedium bessae* Dodson (**Orchidaceae), an exception, nonepiphytic, it is perhaps the most sought-after wild orchid species of the 20th century. [2]

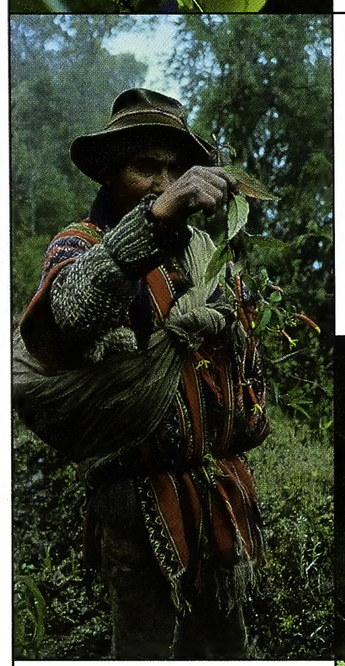
▶ Ecuador: **Habit—Tree: Trees are far more abundant and diverse in the tropics than in the temperate regions** where one or a few species may dominate. Pictured: an undescribed **Maquira* species (Moraceae) found by MBG scientists Alwyn Gentry and Calaway Dodson at Rio Palenque, Ecuador. [4]



◀ Peru: **Habit—Liana:** **Memora pseudopatula* Gentry (**Bignoniaceae). Lianas—climbing plants—depend on the support of trees to reach the well-lighted canopy far above the forest floor. They are abundant in the tropics. The liana shown here is common in the seasonally inundated forests near Iquitos, Peru, but it was studied and described scientifically for the first time by an MBG researcher only in 1981. [4]

▶ Colombia: **Habit—Tree:** **Tabebuia striata* Gentry (**Bignoniaceae): A tree of the tropical wet forests in Panama and Colombia. This species was discovered only recently in the Chocó region, one of the wettest places on earth. MBG has active projects in Panama and Colombia, where the Chocó wet forests are the most poorly known on earth. Similarly rich forests occur in the wettest areas of the Old World tropics. [4]

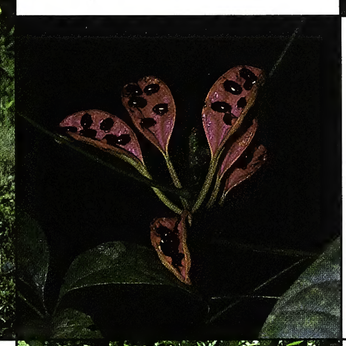
◀ Cameroon: **Habit—Tree:** *Microberlinia bisulcata* (**Leguminosae). MBG is a center for the study of legumes, a plant family with some 18,000 species. Even though the majority of legume species are very poorly known, members of this family are exceptionally important for food, medicinals, forage, timber, and as fast-growing sources of firewood. **Bacteria that form nodules on their roots fix nitrogen from the air and thus fertilize the plants, enabling them to grow on poor soils.** The intricate details of tropical ecosystems are mostly poorly understood, which is a major reason that they are so difficult to replace with sustainable agricultural or forestry plots. **The kinds of coevolutionary interactions that occur in the tropics can be examined in depth only by understanding the whole set of organisms in a particular place.** [12]



◀ Bolivia: **Economic Plants—Crops:** All of the world's main crops have been derived from wild relatives whose genetic diversity has been agriculturally maintained through cultivation by native peoples. **Only 20 of the 265,000 kinds of plants account for more than 80% of the world's food consumption.** Many of these came from the tropics, where thousands of additional species could become sources of food if they were properly understood and evaluated. [10]

◀ Africa: **Economic Plants—Medicinals:** MBG scientists are engaged in a five year program sponsored by the National Cancer Institute to collect native plants in Africa for screening as possible sources of anti-cancer drugs. Collecting and scientifically naming plants forms the basic knowledge for further research, research related to sustainable agriculture and forestry, conservation, and the economic exploitation of potentially useful substances. [11]

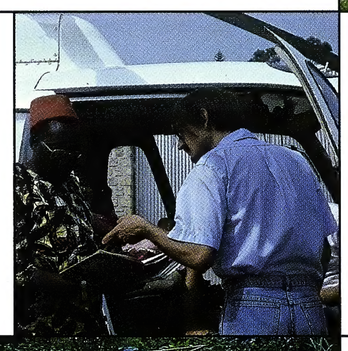
◀ Colombia: **Botany is International:** Enrique Forero, native of Colombia, is MBG's director of research. Specializing in the plants of the New World tropics, he directs our programs of research and exploration in close collaboration with institutions and individual scientists worldwide. In 1987 MBG sent 42,000 specimens on exchange, and received 40,000; MBG also loaned 45,000 specimens to other institutions. Ten flora projects are in progress. [5]



◀ Cameroon: **Economic Plants Conservation:** Urgent attention must be given to plants of potential economic importance so that they can be understood and conserved. This is the reason, for example, for our concentration on the legume and grass families, the sources of much of the world's food. **Only a few kinds of plants are used by human beings at present.** Botanists are continuously finding new kinds of useful plants. Pictured: *Cola digitata* (Sterculiaceae) belongs to a group of plants with attractive flowers; they provide one of the main ingredients in a popular soda drink. The rainforests of Cameroon, part of the Old World tropics, are the center of diversity of the genus *Cola,* of which there are at least 40 species. **Extinction is occurring more rapidly than discovery and scientific understanding.** [12]

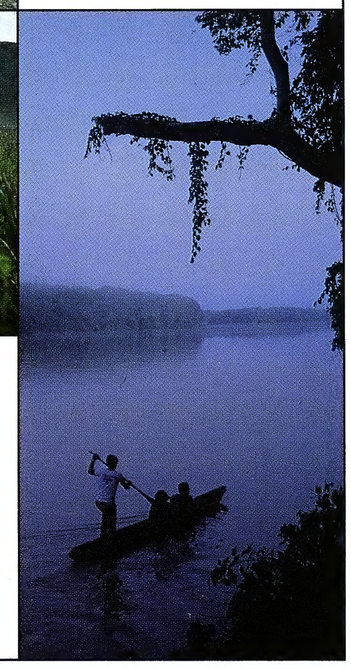
◀ Bolivia: **Botanical Collaboration: There is a great shortage of trained scientists with skills in the vital sciences of systematics, population biology, and tropical ecology.** MBG is an important center for graduate education, in collaboration with Washington University, St. Louis University, the University of Missouri, and Southern Illinois University. [9]

▶ Peru: **Botanical Collaboration:** MBG botanist Alwyn Gentry with Camilo Diaz, a Peruvian botanist who works for MBG. These scientists are involved in studying questions of species diversity and the structure of tropical lowland evergreen forest communities including **the intriguing difference in habit structure between the tropics and the temperate region.** [4]



▶ Cameroon: **Botanical Collaboration:** The future of tropical vegetation, the survival of literally thousands of species of plants, depends on the existence of effective institutions and of well-trained and well-supported scientists in the tropics. There is an absolute necessity to form partnerships with our colleagues in the tropics. Pictured: MBG scientist Duncan Thomas with colleague Benoit Satabie. [12]

▶ Tanzania: **Botanical Collaboration:** In studying plants (or organisms of any kind) in the tropics, botanists are aware that often they may be obtaining **the last samples of a given species that are ever going to be collected.** For this reason, they attempt to obtain material that is as complete and informative as possible, and to preserve seeds when they can be found. Pictured: MBG scientist Jonathan Lovett. [6]



◀ Madagascar: **Conservation—Endemism: Endemic plants are those restricted to a particular area.** More than two-thirds of the estimated 8,200 species of plants that occur in Madagascar are endemic to that island, which is about twice the size of Arizona. Almost all of them are threatened with extinction. Pictured: MBG scientist Porter P. Lowry II and a species of Araliaceae. Many species of plants in Madagascar are in immediate danger of extinction. [7]

◀ Cameroon: **Conservation—Exploration:** Finding, studying, and saving as many of the plants species as possible in those parts of the world that are being destroyed occupies the attention of MBG scientists. **Systematic botanists have a major role to play in the design and implementation of suitable schemes for sustainable agriculture and forestry,** since their knowledge of plant diversity is basic to the design of sustainable systems. [12]

▶ Africa, Cameroon: **Conservation—Cooperation:** The quarter of a million species of plants on Earth form the basis of our civilization and make possible our continued existence. **Extinction is forever, it is a final statement, it allows no further manipulation.** Global cooperation for conservation must be a continuing process and a new international ethic. [12]

Dedication

This poster is dedicated to the Board of Trustees of the Missouri Botanical Garden in the centennial year of its formation (1889-1989).

Research at the Missouri Botanical Garden

Thirty-four Ph.D.-level scientists, ten of whom live in tropical countries, technical staff and graduate students devote their energies to the exploration and the study of tropical plants. These efforts are concentrated in northwestern South America, Central America and Africa.

The individual scientists are specialists in the plants of particular regions or in the classification of certain plant families, such as the economically important grass, legume, and nightshade families.

Their research is carried out in collaboration with scientists of the countries in which they are actively working. Together they are attempting to contribute to a common knowledge of the plants that sustain us all, with a view toward conserving and properly utilizing them.

Photo Credits/Key to Symbols

[1] Richard O. Bierregaard, Jr., World Wildlife Fund
[2] Calaway H. Dodson, MBG
[3] J. Michael Fay, Washington Univ., MBG graduate student
[4] Alwyn H. Gentry, MBG
[5] Roberto Jaramillo, Instituto de Ciencias Naturales, Bogotá, Colombia
[6] Jonathan Lovett, MBG
[7] Porter P. Lowry II, MBG
[8] Nancy R. Morin, MBG
[9] James C. Solomon, MBG
[10] Bruce Stein, The Nature Conservancy
[11] Duncan W. Thomas, MBG
[12] Jane Thomas
[13] Kay Yatskievych

MBG=Missouri Botanical Garden
* identifies new species
** identifies plant families in which MBG specializes